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to supplement at the two ends of the spectrum, 70 lines being shown between Hβ (λ 4861) and D_3 (λ 5876), and 100 between 3500 and 3296.

"Total Eclipse of the Sun, 1901 May 18. Preliminary Account of the Observations made at the Royal Alfred Observatory, Pamplemousses, Mauritius." By E. WALTER MAUNDER, F.R.A.S. Received October 24,—Read at Joint Meeting of the Royal and Royal Astronomical Societies, October 31, 1901.

General Arrangements.

An expedition from the Royal Observatory to observe the Solar Eclipse of 1901 in the island of Mauritius having been sanctioned by the Admiralty, I was instructed by the Astronomer Royal to proceed to that island, there to act in concert with the Director of the Royal Alfred Observatory, Mr. T. F. Claxton, who had expressed his desire to co-operate in the observation of the eclipse. In accordance with a scheme approved by the Joint Permanent Eclipse Committee of the Royal and Royal Astronomical Societies, I took out with me two instruments belonging to the Royal Observatory, Greenwich, for photographing the corona; the one giving an image of the Moon 2·4 inches in diameter, and intended to secure the general structure of the corona, and the other giving an image 0·3 inch in diameter, and intended to secure the outer coronal streamers. The Joint Permanent Eclipse Committee lent for use in combination with these instruments two cœlostats, the one carrying a mirror of 16 inches diameter, the other one of 12 inches. A third mirror, one of 12 inches diameter, was kindly lent by Mr. Frank McClean, F.R.S. My equipment was completed by the generosity of Mr. John Evershed, F.R.A.S., who very kindly placed his prismatic camera of 2 inches aperture at the disposal of the Astronomer Royal for my use in the eclipse.

I was warmly welcomed in Mauritius by the Director of the Royal Alfred Observatory, Mr. T. F. Claxton, and by his Chief Assistant, Mr. A. Walter. Both identified themselves completely with me in my work, and helped me in every possible way. We therefore combined the instruments which I had brought out with those of the Observatory, and worked with them as though we formed but one party, and as if the instruments were all part of the same equipment.

I was also greatly indebted to Sir Charles Bruce, G.C.M.G., the Governor of the island, and to Sir Graham Bower, K.C.M.G., the officer administrating the Government during the Governor's absence, for the ready hospitality which they extended to me. Through their action, also, my instruments were landed without Customs examina-

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tion and were conveyed by rail, free of cost, up to Pamplemousses, and back again after the eclipse was over. Free passes on all the railways of the island were also issued to me, and to Mrs. Maunder, who had accompanied me with a special instrumental equipment of her own. The military authorities also rendered great assistance. Lieutenant-Colonel H. J. Lyster, R.G.A., gave permission to nine non-commissioned officers of the garrison, who had volunteered for the purpose, to come down to assist in the eclipse observations. Of these, five also helped in the unpacking and erection of the instruments, and one, Staff-Sergeant R. M. Smith, A.O.C., gave great assistance in the cleaning, repair, and rating of the several driving-clocks. The expedition was also indebted to the Hon. Hamilton Stein, who undertook the re-shipping of the instruments for the homeward voyage; to Mr. G. Ireland, who supplied tarpaulins for covering the skeleton huts erected to shelter the instruments; to Captain A. W. de Wilton, Inspector-General of Police, who sent constables to keep the Observatory grounds from intrusion on the morning of the eclipse, and to Mr. D. P. Garrioch, Superintendent of Inland Revenue, who arranged for the greater part of the provisioning of the eclipse party during their stay at the Observatory.

Itinerary.—The instruments for the Mauritius expedition were despatched from the Royal Observatory on March 6, with the exception of the prisms and object-glass of the prismatic camera lent by Mr. John Evershed, F.R.A.S., which I took to Marseilles with my personal baggage. The instruments were embarked at the Royal Albert Docks on the ss. "Bagdad" of the Messageries Maritimes line, and transhipped from that vessel to the ss. "Melbourne" of the same line at Marseilles. I left London on March 23, and proceeded overland through France to Marseilles. Owing to the great dock strike then prevailing at Marseilles, the ss. "Melbourne" was not able to leave until the evening of March 26. The delay was, however, made up for by greater speed on the voyage, and Mauritius was reached on April 20, as had been originally expected. The return voyage was unexpectedly delayed, as the Messageries line quarantined the island on account of the plague there, and the Union-Castle steamers having ceased to run to Mauritius, in consequence of the South African war, the British India line *viâ* Colombo was the sole remaining homeward route, and even on this line the steamers only ran once a month. It was not possible, therefore, to leave Mauritius again until July 12, when I embarked on the ss. "Warora"; reaching Colombo on July 22. Here I had to wait until July 25, when I left by the ss. "Mombassa," also of the British India line, and reached London August 25. The instruments left Mauritius in the ss. "Slingsby" on July 12, and were received at the Royal Observatory, Greenwich, on September 10.

Station.—The station occupied was the Royal Alfred Observatory,

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Pamplemousses, in the low-lying plain which occupies the north of the island of Mauritius. This was about 15 miles to the N.W. of the central line, but as the eclipse was one of long duration, the distance from the central line made but little difference to the length of totality, and several important considerations led to its adoption. First of all, the probabilities of fine weather at the time of the morning when the eclipse would take place, appeared much greater for the low ground in the north of the island, than for the hills in the centre; an anticipation which the event fully justified; for whilst the total phase of the eclipse was observed under favourable conditions at Pamplemousses, it was entirely lost in cloud at Curepipe, on the central line on the high ground in the interior. Next, there were the great advantages offered by the Observatory itself of accurate determination of time, of a site the co-ordinates of which were known, of two instruments on permanent mountings, an equatorial and a photoheliograph, suitable for use in the eclipse, and of two efficient and well constructed dark-rooms for photography.

The observing station was therefore fixed in the Observatory grounds, in Lat. 20° 5′ 39″ S. and Long. $3^h\ 50^m\ 12^s{\cdot}6$ E. according to the "Nautical Almanac," on the authority of the late Dr. C. Meldrum, the former Director.

Erection and Arrangement of the Instruments.

The instruments were landed from the "Melbourne" at Port Louis, on April 23, and were conveyed by rail to Pamplemousses, and from thence by road to the Observatory, the same day. The next day they were unpacked, and the positions which they were to occupy were chosen.

The main building of the Observatory is rectangular in form, and nearly but not exactly orientated. Its front or north side is $76\frac{1}{2}$ feet in length, and its breadth is $58\frac{1}{2}$ feet. Opposite the north front and distant from it 160 feet, is the Magnetic Basement, a structure of which only the roof is above the ground, and which is 43 feet square. A broad lawn extends between the two buildings, and the instruments were erected for the most part at the west end of the lawn, so as to command as much of the eastern sky as possible. It was, however, found necessary to cut down a clump of trees on the eastern side of the lawn to a height of 16 feet in order to secure an uninterrupted view of first contact, which would take place when the sun was only 5° high, and this Mr. Claxton accordingly had done.

The instruments were mounted in two divisions. The first division consisted of the Mauritius photoheliograph, which was dismounted from its equatorial stand in a detached dome in the Observatory grounds, and of a rapid rectilinear lens by Dallmeyer, of 4 inches

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aperture and 32 inches focal length. These two instruments were placed horizontally, the camera of the R.R. lens being placed immediately above the photoheliograph tube, and both were supplied with light by means of a 16-inch mirror mounted on a cœlostat. The second division consisted of the Greenwich coronagraph, and Mr. Evershed's prismatic camera. The coronagraph was mounted in a horizontal position, and the prismatic camera was fixed immediately above it, both instruments being supplied with light by a 12-inch mirror mounted on a cœlostat. Between the two a clock was mounted which rang an electric bell close to the camera end of the photoheliograph, and another close to the 12-inch cœlostat, at every tenth second during totality. The instruments were fixed upon boxes filled with stones, and to shelter them skeleton huts were formed, each consisting of three pairs of poles carrying a ridge-pole. Tarpaulins were then thrown over the ridge-pole, and pegged down to the ground. When any instrument needed to be used, one or more of the tarpaulins could be thrown up on the side upon which it was desired to observe. During the eclipse all the tarpaulins were entirely removed, except one fixed round the 10-second clock, which was left in order to shelter the pendulum from the wind.

The positions of the instruments relative to the Observatory buildings are shown in the accompanying plan, in which are also indicated the positions of Mrs. Maunder's instruments, which were also set up in the Observatory grounds.

The above arrangement of the instruments was finally completed by May 11 when the prismatic camera was mounted, one week before the eclipse.

Personnel.—The following list gives the names of those who took part in the observations:—

With the 16-inch cœlostat and its telescopes—

T. F. Claxton—Mauritius photoheliograph. Large-scale photographs of inner corona.

Bombardier A. J. Cox—Recorder to Mr. Claxton.

Bombardier C. A. Truman—Carried plate-holders for Mr. Claxton to and from dark-room during the partial phase.

Charles G. Garrioch—Changed the plates in the plate-holders during the partial phase.

T. A. Pope—Rapid rectilinear lens. Small-scale photographs to show extension.

E. G. Rowden—Exposed at the object-glasses of both the photoheliograph and the R.R. lens for Mr. Claxton and Mr. Pope.

With the 12-inch cœlostat and its telescopes:—

E. Walter Maunder—Greenwich coronagraph. Large scale photographs of corona.

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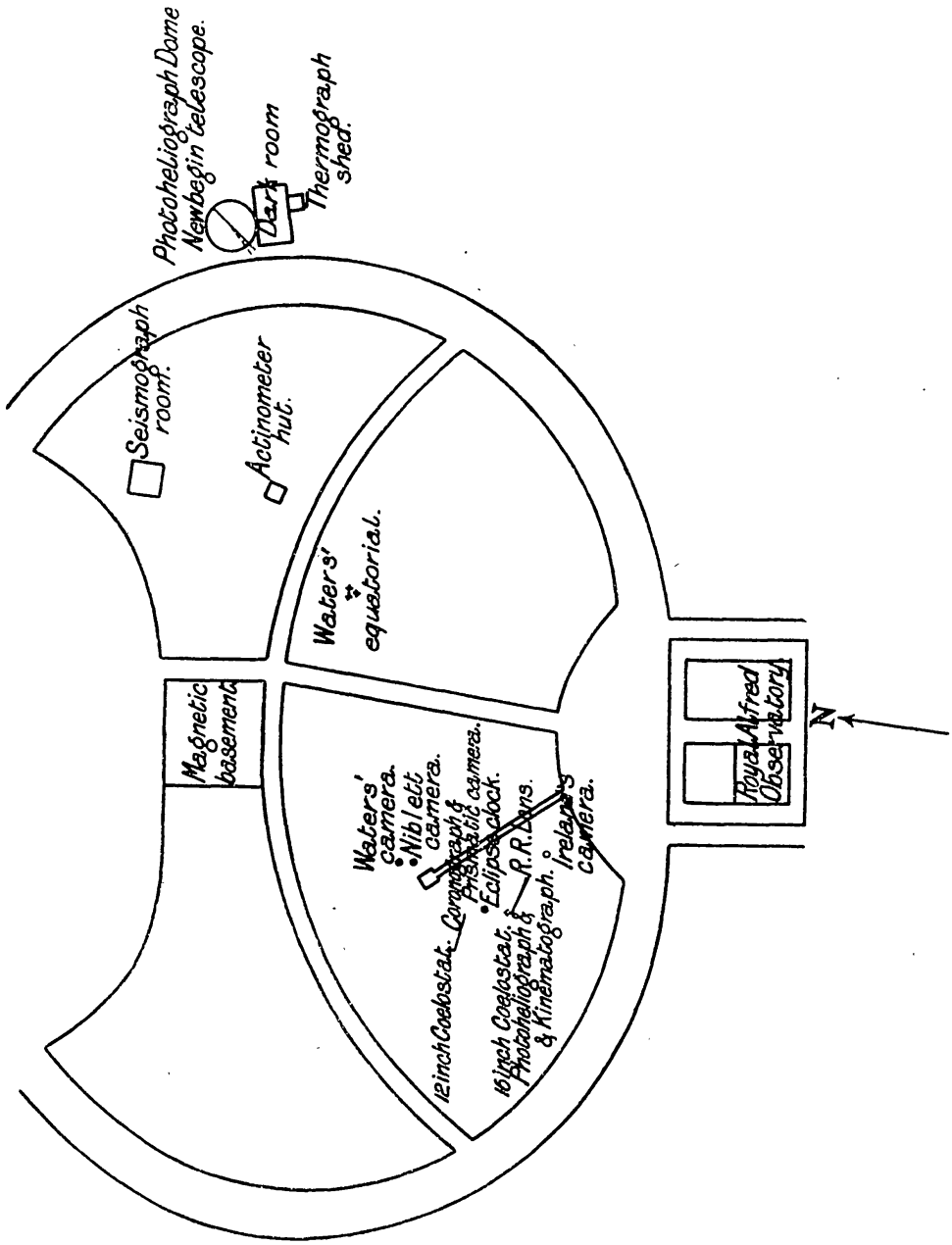
Lance-Corporal Lilley—Recorder to Mr. Maunder.

Bombardier W. Bailey—Moved rack-work of the Evershed prismatic camera.

Colour-Sergeant-Major W. Wade—Exposed at the object-glasses of both the coronagraph and the prismatic camera.



Plan of the Grounds of the Royal Alfred Observatory, Mauritius, showing the distribution of the Instruments during the Total Solar Eclipse of 1901, May 18.

With the 10-seconds eclipse clock :—

Staff-Sergeant R. M. Smith—Time-keeper at 10-second clock.

F. W. Robertson, Lieutenant, R.E.—Recorded times of the 10-second signal-bells.

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With the 6-inch equatorial of the Mauritius Observatory :—
F. T. Piggott—Observed with the 6-inch equatorial.
N. V. Olivier—Recorder to Mr. Piggott.

The following was the method of procedure, which was carefully rehearsed many times on May 16 and 17. The observers took their places at their instruments, and Mr. Claxton watched the diminishing arc of the Sun on the ground glass of the photoheliograph, and at 30 seconds before second contact gave the word to "Stand by." At 20 seconds I gave the word to Sergeant-Major Wade to begin the exposure of the plates in the prismatic camera. At 10 seconds, when the arc of sunlight had lessened down to one of 49°, Mr. Claxton called "Ten," the signal to Staff-Sergeant Smith to start the 10-seconds striking eclipse clock, and Staff-Sergeant Smith called the number of the bells as they rang out at every tenth second from this moment until some time after third contact. The exposures at the different cameras were then made at the sound of the bells, and Lieutenant F. W. Robertson, R.E., entered the time of each bell as it rang; a very simple arrangement, which worked smoothly and well, and gave the times of exposure of the different plates very closely.

The Day of the Eclipse.—The weather at eclipse time—*i.e.*, from $6^h\ 51^m$ to $9^h\ 5^m$ A.M.—had been by no means promising for the first three weeks after landing, but had tended to improve later. The morning of May 18 was the first upon which the Sun had been entirely free from cloud at the time of totality, $7^h\ 53^m$ A.M., and even on that morning first contact was lost by the interposition of a dense bank of cloud, which came up from the east soon after sunrise and overtook the Sun. It passed away in a few minutes, and the first photograph of the partial phase was taken at 16 minutes after the predicted time for first contact. Light scud continued to pass over the Sun for about 40 minutes more, but got thinner and lighter as totality drew on, and about $2\frac{1}{2}$ or 3 minutes before second contact the entire eastern half of the sky was free from cloud, and remained so until after fourth contact. But though the sky was thus apparently clear there was evidently much moisture in the air, since at Quatre Bornes, 13 miles to the south-west, the total phase was observed in a smart drizzle of fine rain; and at Curepipe, 16 miles to the south, it was entirely lost by thick cloud. The images also, as seen upon the ground glasses of the photoheliograph and coronagraph, were very unsteady, the Sun's limb "boiling" excessively. This "boiling" effect would seem to have been less noticeable in the 6-inch equatorial mounted in a dome on the roof of the Observatory main building, and in the Newbegin telescope brought by Mrs. Maunder and mounted in the photoheliograph dome of the Observatory, and which were therefore at a considerable elevation than in the instruments fed by the two

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cœlostats which were necessarily quite close to the ground. The position of the latter, in the open air and placed horizontally, would render them more exposed to the effect of ground currents than the two other telescopes would be, pointing upwards at an angle of 19° and within domes.

The darkness during totality to the observers out in the open air was not great, the general illumination being considerably greater than at the full Moon. Five observers, noting the twilight illumination in the evening after the eclipse, considered it equal to that of mid-totality at the following local times:—

	h.	m.
Mrs. Claxton	5	58 P.M.
Mrs. Maunder	5	57
Mr. Claxton	5	58
Mr. Hall	5	58
Mr. Maunder	5	57

corresponding in the mean to 31 minutes after geometrical sunset, or to a position of the Sun, neglecting refraction, of 6° 53′ below the horizon.

But the observers in the equatorial and photoheliograph domes found it very dark during totality. A sudden gust of wind came from the N.E. at the moment of second contact and blew out the observer's candle in the equatorial dome. The recorder here, Mr. Olivier, found it quite impossible to read his chronometer or to write in the darkness, and hence Mr. Piggott's determination of the times of the second and third contacts were wholly lost.

Venns and Mercury were both very brilliant, side by side, some 5° below the Sun, whilst Jupiter and Saturn were prominent in the western sky. No search was made for other celestial objects.

Times of the Contacts.—The following determinations were made of the times of the three last contacts. As already stated, the first contact was lost through cloud:—

Observer	T. F. Claxton.	E. W. Maunder.	A. Walter.	Capt. Robertson.
Place	R. Alfred Obs.	R. Alfred Obs.	R. Alfred Obs.	ss. "Ugina."
Instrument	Photoheliograph	Coronagraph.	Newbegin telesc.	Navy telescope.
Aperture	4 in.	4 in.	4½ in.	2 in.
Chronometer	Kullberg 3400.	H. White 1424.	Webster 925	
Error of chronometer	1m 0s·4 f.	3h 53m 47s·3 s.	2m 58s s.	
Observed times—				
Second contact.	..	3 57 52·2	7h 48m 43s	
Third contact..	..	4 1 25·1	7 52 15	
Fourth contact	9h 5m 43s·0	5 10 55·1		
True local times—				
Second contact.	..	7 51 39·5	7 51 41	7h 51m 38s
Third contact..	..	7 55 12·4	7 55 13	7 55 12
Fourth contact	9 4 42·6	9 4 42·4		

e

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Captain Robertson was not present at the Royal Alfred Observatory, but observed the eclipse from the deck of his ship, ss. "Ugina," of the British India Steam Navigation Company, in Port Louis harbour, 6½ miles S.W. by W. of the Observatory.

An accident prevented Mr. Claxton from observing the second and third contacts. Mr. Claxton and myself watched the contacts on the ground-glass screens of our respective cameras.

Times of the 10-second Bells.—The times of the 10-second bells of the eclipse clock—which was one of the clocks used by the late Sir G. B. Airy, K.C.B., in the Harton Colliery experiment—were recorded by Lieutenant F. W. Robertson, R.E., with the chronometer Kullberg 3400, that chronometer being $1^m\ 0^s{\cdot}4$ fast.

No. of Bell.	Observed time.			True local time.		
	h.	m.	s.	h.	m.	s.
1	7	52	42·3	7	51	41·9
2			52·3			51·9
3		53	2·3		52	1·9
4			12·2			11·8
5			22·1			21·7
6			32·1			31·7
7			41·9			41·5
8			51·9			51·5
9		54	1·8		53	1·4
10			11·8			11·4
11			21·8			21·4
12			31·7			31·3
13			41·8			41·4
14			51·8			51·4
15		55	1·8		54	1·4
16			11·8			11·4
17			21·7			21·3
18			31·7			31·3
19			41·7			41·3
20			51·8			51·4
21		56	1·6		55	1·2
22			11·6			11·2
23			21·6			21·2
24			31·6			31·2

Staff-Sergeant R. M. Smith called out the numbers of the bells as each rang.

Photographs of the Corona.—These were taken on three different scales; the first on a scale of 8 inches to the Moon's diameter, to show the prominences and lowest corona; the second on a scale of 2·4 inches, to show the general structure of the corona; the third on a scale of 0·3 inch, to show the coronal streamers to the greatest possible extension. The aperture employed in each case was the same, viz., 4 inches, and the light-gathering powers on the plate of the three instruments were nearly in the proportion of 1, 11, and 700.

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(1.) *Photographs on the 8-inch Scale.*

These were taken by Mr. T. F. Claxton with the photoheliograph of the Royal Alfred Observatory, Mauritius, the object-glass of which is 4 inches in aperture and 5 feet in focal length. It gives an image of the Sun nearly 8 inches in diameter, being fitted with a secondary magnifier, enlarging the image in the primary focus $13\frac{3}{4}$ times. The total length of the photoheliograph was $9\frac{1}{2}$ feet; its equivalent focal length 69 feet. The camera was constructed to carry plates 10 inches square, and it was proposed to expose six plates during totality for photographs of the corona, and as many as possible during the partial phase for determination of the Moon's place, and of the relative diameters of the Sun and Moon. Only three plates were exposed during totality, the handle of the shutter of the fourth plate-carrier breaking short off when the shutter was opened. The plate-carrier was thus locked in the camera, and it was not possible to release it until the total phase was over. The three plates taken were exposed as below, the exposures being given by Mr. Rowden at the object-glass of the instrument at the sound of the signal bells.

No.	From	To	Duration of exposure.	Plate.
			sec.	
1	Bell 3	Bell 5	20	Edwards' Medium.
2	,, 6	,, 8	20	Imperial Ordinary.
3	,, 8	,, 11	20	,, Special Rapid.

After totality the clock of the cœlostat was stopped, and three photographs of the Sun were taken on the same plate for orientation. The true local times of the first and last of these were :—

h.	m.	s.
8	15	20·1
8	16	5·2

The time of the second exposure was not recorded. The plate was an "ordinary lantern" by Cadett and Neale. The aperture of the photoheliograph was reduced to $1\frac{1}{2}$ inches, and the exposure was given by the drop-slit in the primary focus.

Two sets of "Abney squares" were printed upon No. 3 on June 13, before the plate was developed. Both sets were printed by the light of a Sugg's Standard candle; the one being exposed for 4 seconds, the other for 64 seconds, the candle being at a distance of 10 feet in both cases.

The corona is seen only on the E. side of the Sun, as the image is

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somewhat out of the centre of the plate in all three of the photographs; and owing partly to shake in the instrument, and partly to the excessive atmospheric disturbance, which under the high magnification employed was very apparent, the definition is poor in each case.

No. 1. The corona is shown to a height of about 1 minute of arc. The image is faint.

No. 2. The corona is shown to a height of about 3 minutes of arc. The image is fairly dense.

No. 3. The corona is shown to a height of about 2 minutes of arc. The image is faint and flat.

The Mauritius photoheliograph was focussed by repeated photographs of the Sun, taken during the fortnight preceding the eclipse.

(2.) *Photographs on the 2·4-inch Scale.*

These were taken with the object-glass of the Dallmeyer photoheliograph No. 5, belonging to the Royal Observatory, Greenwich —and which, like that of the Mauritius photoheliograph, had an aperture of 4 inches and a focal length of 5 feet—used in connection with a concave telephoto lens by Dallmeyer, of 3 inches aperture and 12 inches focal length. The instrument thus constructed has been referred to for convenience as the "Greenwich coronagraph," and was about $7\frac{1}{2}$ feet in actual length, with an equivalent focal length of nearly 21 feet. It was furnished with ten plate-holders to take 12 by 10-inch plates, and it was proposed to take seven photographs during totality.

These photographs were taken by myself, Colour-Sergeant-Major Wade exposing at the object-glass of the instrument by the signal bells as follows:—

No.	From	To	Duration of exposure.	Plate.
			secs.	
1	Bell 2	Bell 3	10	Wratten and Wainwright Instantaneous.
2	,, 4	,, 6	20	Ilford Empress.
3	,, 7	,, 11	40	Imperial Special Rapid.
4	,, 12	,, 15	30	,, Sovereign.
5	,, 16	,, 18	20	,, Fine Grain Ordinary.
6	,, 19	,, 20	10	,, Special Rapid.
7	,, 21	—	4	,, Ordinary.

After the ground glass had been inserted for the observation of third contact, and had been removed again, the aperture was diminished to half an inch, and the clock of the cœlostat stopped and three photo-

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graphs were taken of the Sun, on the same plate for orientation. The plate was an Imperial Fine Grain Ordinary and the exposure was as quick as could possibly be given by uncovering and covering the object-glass by hand. The true local times of the three exposures were :—

h.	m.	s.
7	58	39·3
7	58	57·3
7	59	17·3

A ninth plate, a Wratten and Wainwright Instantaneous plate, was exposed with the same aperture and exposure at $8^h\ 0^m\ 17^s{\cdot}3$. The plate in the tenth plate-holder was not used.

Two sets of "Abney squares" were printed upon No. 4 on June 13, before the plate was developed. Both sets were printed by the light of a Sugg's Standard candle, at 5 feet distance; the one being exposed for 15 seconds, and the other for 4 minutes.

No. 1 is a clean and fairly dense negative, showing well the polar rays and the structure of the lower corona, especially in the east equatorial wing. The west wing shows less detail. The corona is traceable to a distance of 15 or 16 minutes from the limb of the Moon in the S.E. ray.

No. 2 is a clear thin negative showing much about the same detail as No. 1.

No. 3 is a thin negative but shows a considerable extension of the great S.E. and N.E. rays and a good deal of detail in their lower regions.

No. 4 is a dense negative showing the greatest degree of extension in the coronal streamers of any of the series. In the case of the two chief rays, the corona can be traced to a distance of nearly half a degree from the Moon's limb.

No. 5 shows the lower corona well up to 5 or 6 minutes from the Moon's limb.

No. 6 is partly spoiled by fog, and only the lower corona is seen up to about 3 minutes.

No. 7 is a faint and delicate negative showing the chromosphere, prominences, and the lower corona up to a distance of about 3 minutes from the limb of the Moon.

Two methods were employed to focus the Greenwich coronagraph; the first being the method described by the Astronomer Royal in his Reports of the Eclipse Expeditions of 1896, 1898, and 1900,* an image of an object (gauze net in the plane of the plate) being photographed by reflection normally from the plane mirror of the cœlostat. The second method was by photographing Arcturus, the image of which was allowed to trail across the plate.

* 'Roy. Soc. Proc.,' vol. 64, p. 8; and 'Monthly Notices, R.A.S.,' vol. 57, p. 105, and vol. 60, p. 397.

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(3.) *Photographs on the* 0·3*-inch Scale.*

These were taken by Professor T. A. Pope, of the Royal College, Mauritius, with a Dallmeyer rapid rectilinear lens of 4 inches aperture, and 32 inches focal length, Mr. E. G. Rowden exposing at the object-glass at the same time as he exposed for the Mauritius photoheliograph, which was mounted immediately below it. Six plate-carriers were provided for this instrument, and six photographs of the corona were secured.

No.	From	To	Duration of exposure.	Plate.
			sec.	
1	Bell 3	Bell 5	20	Imperial Process.
2	,, 6	,, 8	20	,, Ordinary.
3	,, 9	,, 11	20	,, Special Rapid.
4	,, 12	,, 14	20	Ilford Empress.
5	,, 15	,, 17	20	Wratten and Wainwright Instantaneous.
6	,, 18	,, 20	20	Imperial Fine Grain Ordinary.

The plates used were 16 cm. square, and the Sun was placed a little to the west of the centre of the field, so that Venus and Mercury might be included in the photographs. As they are well shown on all the plates, there was no need for any other mode of orientation, and no special photographs were taken for that purpose. Nor were the "Abney squares" printed on any of the plates with this instrument.

No. 1. A good clear negative. On the west side of the corona four straight rays are seen, the two longest extending about $1\frac{1}{4}^\circ$ from the Moon's limb. On the east two chief rays are seen, forming the edges of the great east equatorial wing of the corona. A fainter ray runs nearly parallel to the great N.E. ray. The rays on the E. are traceable to about 1° from the Moon's limb.

No. 2. Neither so dense nor so clear as No. 1, nor can the rays be traced quite so far upon it.

No. 3. The sky glare has come up on this plate, which in consequence shows less than Nos. 1 and 2.

No. 4. Definition poor.

No. 5. Definition poor.

No. 6. Very dense image; the rays on the west can be traced to more than 2° from the Moon's limb.

The Dallmeyer R.R. lens was focussed by repeated photographs of star fields, especially of the field of the Southern Cross.

Development of the Photographs.—Owing to my having been taken ill on May 21 with a severe attack of malarial fever, the work of

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developing the photographs was almost entirely carried out by Mr. Walter and by Mrs. Maunder, to whom the expedition is therefore greatly indebted for the results obtained. The weather being hot and damp, much difficulty was experienced with the different plates tested by way of experiment before the day of the eclipse. Finally the following developer was adopted and found to work well. In spite of its excessive dilution, it was found that fog resulted if its strength was materially increased.

Solution A.

Metol	40 grains.
Hydroquinone	50 ,,
Sulphite of soda	120 ,,
Bromide potassium	15 ,,
Water	20 ounces.

Solution B.

Caustic soda	100 grains.
Water	20 ounces.

For development half an ounce was taken of each stock solution and made up with water to 30 ounces, 15 drops of a 10 per cent. solution of bromide of potassium being added. During development this solution was strengthened by the gradual addition to it of a solution composed of 1 ounce of each of the two stock solutions made up with water to 10 ounces. But the stronger solution was seldom added to the weaker in a greater proportion than 1 to 15. The average time of development was 75 minutes.

Photographs of the Partial Phase.—These were taken with the photoheliograph of the Royal Alfred Observatory, Mauritius, already described. The aperture for this purpose was reduced to $1\frac{1}{2}$ inches, and the exposure given by the drop-slit in the primary focus. Mr. T. F. Claxton made the exposures, and called the times by Kullberg 3400 to Bombardier Cox, who entered them. There being only three plate-carriers available for this work, Mr. C. Garrioch remained in the dark room to change the plates, and Bombardier Truman ran to and fro with them. The plates used were Cadett and Neale's ordinary lantern plates. The times of exposure were as follows :—

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Before Totality.

No.	Observed times. h.	m.	s.	True local times. h.	m.	s.
1	7	8	19·8	7	7	19·4
2	7	10	19·8	7	9	19·4
3	7	14	5·3	7	13	4·9
4	7	18	1·3	7	17	0·9
5	7	22	46·3	7	21	45·9
6	7	28	47·3	7	27	46·9
7	7	31	7·8	7	30	7·4
8	7	35	6·2	7	34	5·8
9	7	38	47·3	7	37	46·9
10	7	42	43·0	7	41	42·6
11	7	44	32·4	7	43	32·0

After Totality.

12	8	2	48·8	8	1	48·4
13	8	3	43·3	8	2	42·9
14	8	11	44·5	8	10	44·1
15	8	12	41·0	8	11	40·6

Plate 16 had three exposures made upon it, the clock of the cœlostat being stopped in order to give the means for determining the orientation of the plates.

No.	Observed times. h.	m.	s.	True local times. h.	m.	s.
17	8	19	40·0	8	18	39·6
18	8	22	34·3	8	21	33·9
19	8	24	25·7	8	23	25·3
20	8	26	44·3	8	25	43·9
21	8	31	28·6	8	30	28·2
22	8	32	33·2	8	31	32·8
23	8	34	40·5	8	33	40·1
24	8	36	24·5	8	35	24·1
25	8	39	56·3	8	38	55·9
26	8	42	7·5	8	41	7·1
27	8	45	13·2	8	44	12·8
28	8	48	15·4	8	47	15·0
29	8	50	33·7	8	49	33·3
30	8	53	8·2	8	52	7·8
31	8	54	5·0	8	53	4·6
32	8	59	50·2	8	58	49·8

The Director of the Royal Alfred Observatory has presented to the Astronomer Royal the photographs of the eclipse which he took with

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